TMF

May 1991

THE MAC FLYER - For Greater Safety in MAC Air Operations

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TMF

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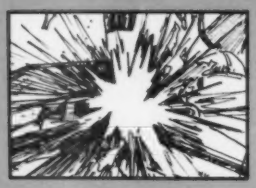

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THE STORM

Angry black clouds of billowing fury stretch across the late afternoon horizon. Blinding flashes of lightning highlight the towering columns of disaster. What began as a routine flight turned into a terrifying roller coaster ride of fear. Crab 21 and 22 are returning to Pope from Lajes with crews anxious to catch up on lost holidays. Following some distance behind is Fist 01, a Talon II, homeward bound to Hurlburt. The three C-130s weave their separate paths through the hostile December sky, unaware that each crew will find themselves tested by nature's fury.

By TSgt James W. McClain, Jr.
1275 TES, Edwards AFB, CA.

The clouds seem to reach out as though resentful of the approaching intruders. "Damn," Crab 21's loadmaster yells, as the turbulence throws her box lunch to the cargo floor. "Crab 21, this is Crab 22, over." Two-one's copilot gently nudges his AC's right arm. The pilot, intent on his flying, misses the radio call. "Crab 22, this is 21, go ahead" he replies tensely. "Roger 21, the weather isn't looking too pure, is it?" "Tell me something I don't know 22,"

HONORABLE MENTION
1990 MAC FLIGHT SAFETY WRITING CONTEST

he says as another quick, but violent shock passes through the airframe. "Can't tell much with daylight fading, but the nav's still confident he can thread his way to the other side. We're pressing on." Crab 21's flight engineer says nothing as he makes a quick scan of the ever-blurring engine instruments.

Crab 22's pilot pauses before answering. "Our nav says the same, but I'm not so sure." His copilot is sweating from the effort it takes to control the plane. "Nav, AC, how does it look up ahead now?" asks 21's pilot. Hunched over his table, looking like an octopus trying to keep his charts, instruments, and lunch from rolling off, the nav peers into his scope and tells the pilot to turn a few more degrees.

On board 22, the navigator adjusts his seat belt once more before tuning the radar. After several minutes, he makes a quiet call. "AC, Nav, it appears the radar's gone to radar heaven." "You sure, nav?" the AC asks sharply. "Yes sir. I've gone through the troubleshooting checklist and there's nothing we can do in flight." Half a minute goes by before the AC says resignedly, "Well, I guess that does it. Might as well call 21 and give them the bad news."

"Stand by, AC," the flight engineer interrupts. "Let me go downstairs and see if I can rattle a few boxes around." The AC puts his right hand up signaling "No" and says "Never mind, the nav's gone through the checklist and I don't want anyone moving around any more than necessary—at least not until we're clear of the weather," he finishes.

"Crab 21, this is Crab 22." In the dark cockpit of 21, the pilots' faces are bathed by the light of engine instruments. Static is making even interphone communication difficult. Pressing his left headset cup closer to his ear, 21's pilot hears the second call from 22. "Crab 22, Crab 22, go ahead, over," he answers. "Roger 21, our radar is inoperative, repeat, inoperative, and I've decided to turn back to Lajes, over." About to press the transmit button in reply, 21's AC pauses to think before replying, "22, this is 21. Roger on the radar. Guess we'll have to go it alone."

In reply, 22's AC says "You guys sure about continuing on? We're catching a lot more turbulence now." "22, 21. The nav's positive he can get us through. When you contact Lajes, give them our last estimated position, okay?" "Roger on the radio calls, you guys take care," replies 22. With that, 22 banks swiftly into a right turn, away from the gaping blackness.

As Crab 22 heads for the sanctuary of Lajes, Crab 21's loadmasters prepare to tie down several cases of hydraulic fluid shifted loose by the turbulence. One load stops to secure a large stuffed lion that had fallen to the floor. "Nav, AC, looks like you found us a good heading. Let me know when you've got another break in the weather."

Feeling more confident and sure he's made the right decision, 21's AC relaxes for a few minutes and lets the copilot fly. The flight engineer takes the opportunity to make a quick scan of the cabin systems.

Grateful for having no passengers and not having to clean up after missed airsick bags, 22's loadmasters scan for loose cargo. Finding only a couple "rote treasures" loose, they grab their box lunches, ask the engineer to turn the heat up, and settle down for the return to Lajes.

Fist 01's crew faces the approaching storm with increasing apprehension. The AC peers down at his VDT, selects WX, and observes the image presented in startling detail. In clear definition, he can see the same thing the navigator does. Nudging the copilot, he points to the massive image reflected on the screen. With a low whistle, the copilot shakes his head and keys the interphone. "What do you think, Skipper? Looks real nasty out there." Peering out the windscreen, the AC catches a glimpse of distant lightning as the aircraft trembles slightly. Over interphone, he calls the loads, advising them of the approaching weather and instructing them to check the cargo. Almost as quickly, they call back "cabin secure."

Fist 01's EWO is surprised to

DUE TO A LACK OF PHOTOGRAPHIC CONTRAST BETWEEN TEXT AND BACKGROUND, THIS PAGE DID NOT REPRODUCE WELL.

receive the indication of an approaching aircraft. Activating the IDS, he quickly locates the ghostly shape of Crab 22. He alerts the AC and they both watch the aircraft approach over their individual VDTs. "Must be the guys we heard trying to call Lajes a while back," the nav says. "How about giving them a call and see if they need anything?" "Might as well. Yo, eng, make sure we're Christmas tree, will you?" asks the AC. Still keeping an eye on the IDS image and handing control over to the copilot, he calls "C-130, C-130, this is Fist 01, Fist 01, over." Almost immediately, there is a strong reply. "Fist 01, this is Crab 22, over. Sure is nice to hear a friendly voice. What's your position, over?" In reply, 01's AC says "Roger, we're at your ten o'clock-low, about 25 miles. And we're 'Christmas tree,' over."

All available eyes on Crab 22 peer into the darkness, each trying to be the first to spot the unseen but friendly voice. Relieved at having company, 22's AC calls out "Tally Ho!" and leans back in his seat. "Fist 01, we've got you in sight. We're heading back to Lajes with an inop radar. Couldn't see pressing on with that weather in front of us." From Fist 01, the AC calls back "22, copy that last call. We've been painting that nasty stuff for quite a while now. We're thinking about heading back ourselves." His finger slips off the ICS switch as a violent bump suddenly shakes the aircraft. Recovering, he continues, "Our nav doesn't like the looks of it any more than I do. How rough did it get? Over."

Seeing the brightly illuminated Fist 01 approaching, Crab 22's AC answers. "Pretty bad, the radar went out, the loads complained they were tired of hanging from the hog trough, and the engineer said the 'wing off light' was flickering, so I figured enough was enough, over." As he finishes, he stops to rub his forehead. "22, 01 copies. We could probably get home, but I can't see pushing our luck. Don't want to spend our time and fuel dodging weather. We're going to make a right turn and head back for Lajes. Tell you what, we'll take lead and provide radar coverage while you stay in trail, over."

22's AC keys the mike and replies, "Sounds good, 01. We've got you visual." He adds, "Sure do wish our lead was going back with us, over."

Not hearing a reply, 22's AC is about to make another call, when the silence is broken by "22, 01, you mean there's someone else trying to go through that weather? Over." Feeling as if he has violated some sacred trust, 22's AC replies hesitantly, "01, 22, Roger that. Crab 21 felt confident he could make it through. That was about a half hour ago, over."

The calm spell had broken. Crab 21's copilot sensed the warning signs; a slight tremor with an accompanying vibration that abruptly seized the controls from his hands. Eyes wide, he sees the yoke dance about. In reflex, he reaches out, only to see it slam into his outstreched fingers. A yelp of pain explodes from his lips as he jams his legs, in reflex, into the rudder pedals. Cradling his damaged hand against his chest, he leans forward against the yoke, moaning and oblivious to the wildly gyrating aircraft. The AC only has time to mutter a quick "What the hell!" before Crab 21 begins a sharp and violent descent toward the foam-capped ocean below. Left wing and nose down, engines screaming in protest, the angle increases. Pulling with all his might on the yoke, the AC desperately tries to regain control.

The navigator sees the pilot struggling with the controls, pulling with all his might. Knowing that seconds count, he unstraps and tries to move forward, but is stopped by his headset, which he savagely rips off and throws over his shoulder. The flight engineer pops his lap belt and tries to pull the copilot from the yoke. Leaning precariously, he braces his left hand against the glare shield and pushes the copilot back against his seat. He unknowingly pulls his interphone cord loose as a sudden shock almost throws him against the center pedestal.

The AC keys the interphone, calling for help, information, or anything to let him now what's going on. The loadmasters are unable to respond. One is thrown against the bracing aft of the left troop door, then forward where he finally comes to rest across a troop seat, unconscious, blood spreading across the back of his head. The other load futilely puts an arm up as the loosely secured cases of hydraulic fluid crash down on her.

Desperately trying to regain control, 21's AC fails to notice they're continuing to plunge deeper into the storm. Now the nose is moving up, the left wing lifting into the beginning of an aileron roll. The cross currents and violent wind shifts are becoming more than pilot or transport can take. The nav, in an attempt to free the copilot's leg, catches his flight suit on several essential circuit breakers, pulling them. "Nav!" the AC calls into the interphone, "give me a heading out of here." Not hearing anything, he screams, "Eng! Loads! Anybody!"

With a sharp pull, the nav yanks the copilot's leg free of the rudder pedals. He hears a sickening crack as the copilot screams, then faints. The flight engineer loosens his hold on the copilot as his attention is diverted by warning lights connected to the disabled circuit breakers. "AC, I

think we've got a problem on the panel," he calls. Not hearing a reply, he leans forward to scan more closely as the copilot slumps forward.

The AC is beginning to feel the transport respond. The rudder pedals move freely but the '130 is viciously slammed into a nose up attitude, right wing angled down. With the yoke jammed forward, the aircraft begins to enter a stall. The engineer falls onto the center pedestal, pushing several more switches out of position and dislodging the engine throttles. The AC is fighting both the physics of disrupted flight and lack of information about the condition of his aircraft. Frustrated with rage, sweat stinging his eyes and blurring his vision, his strength all but gone, he feels his body becoming weightless as Crab 21 begins to fall.

The cargo in the cabin begins to shift in free fall, the loadmasters, both unconscious, unable to report. The navigator, unable to dislodge himself, can only look up from the cold floor and see the pale face of the unconscious copilot. The engineer manages to push himself off the throttles, clear of the center pedestal. The AC desperately gropes for the throttles. Crab 21 is now approaching the bottom of its long fall. Sensing, more than knowing the water is near, the AC tries to make what he hopes is a survivable ditching. Just before impact, he keys his microphone and calls "Crab 21, Mayday!" several times.

Crab 21 impacts the water in a nearly level attitude. The combination of lack of situational awareness, several vital aircraft systems off line due to pulled circuit breakers, and the force of the cargo slamming back down into the cargo floor, all contribute to the breakup of the aircraft upon impact. Crab 21 bounces and slides forward a short distance before the left wing breaks off and engines cartwheel into space. The fuselage breaks into two major pieces; tail section and cabin/flight deck.

On board Fist 01 the crew is anticipating the landing at Lajes. The faint "Mayday" call is first heard by the EWO who alerts the others. Hearing nothing more and then a CPI beacon, the AC contacts Lajes control and then directs the crew to prepare for search and rescue.

The engineer announces they have sufficient fuel for search, loiter, and return to Lajes. The navigator queries Lajes control for weather updates, sea conditions, etc., and verifies the engineer's data. The EWO checks his systems and confirms the IDS is ready for surveillance. The loads announce they've prepared several makeshift rescue kits. The AC digests the information, looks over at his copilot, gets a thumbs up, and announces their intentions to Lajes control.

Before turning, the AC calls 22's AC and suggests they continue to Lajes, both for safety reasons and to assist in any rescue coordination. In a shaky voice, Crab 22's AC agrees, since he knows he has a responsibility to his crew and to those now down. With a left turn, Fist 01 heads back into the threatening mass of fury. Crab 22 begins it solitary return to Lajes, the crew silent.

The first tremors of the storm begin to embrace the Talon II as it descends into the search area. Keeping in mind the storm could still claim another victim, the AC covers crew duties during the search. Both pilots will take turns flying TF. The flight engineer will monitor the pilots and aircraft systems. The navigator will watch the storm and keep them out of harm's way. The EWO will control the IDS and scan for survivors. The loads will scan from the troop doors and be prepared to drop survival kits.

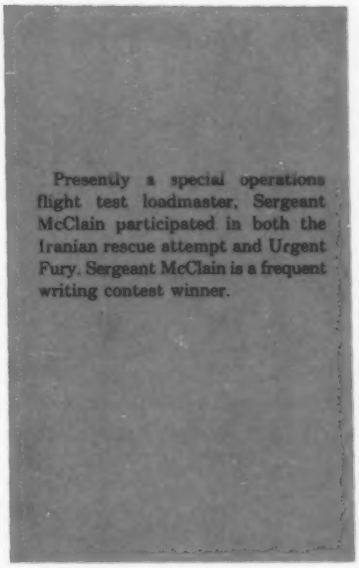
The Talon II was sweeping above the wind driven, foam tipped waves when the EWO spotted a faint glow in the distance. With the IDS locked on, the crew strained to see what the source was. Hoping against hope, their worst fears are confirmed when the glow turns out to be a wing section, still afloat and burning. The IDS paints a surreal picture of the wreckage below. The only signs of what had been an aircraft and crew are seat cushions, a partially inflated life raft, and a large stuffed animal, bobbing aimlessly on the waves.

* * *

Author's Comments: Fact of fiction? Could you put yourself or someone you know, or have known, in a situation like this?

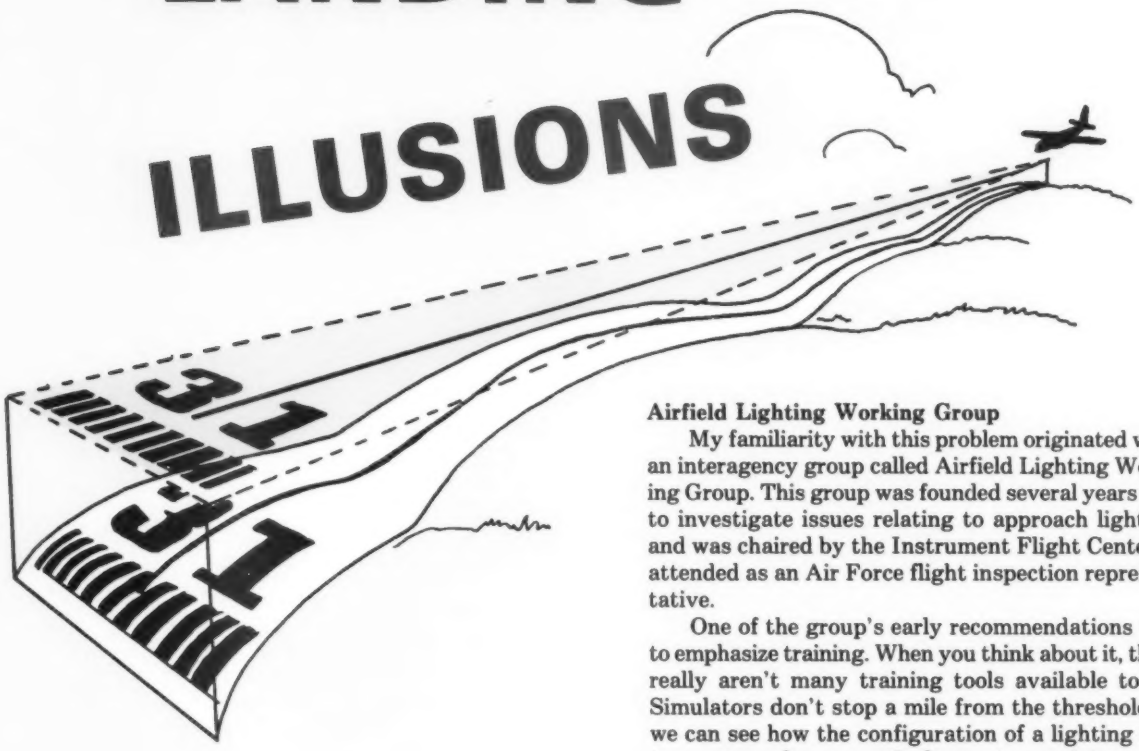
Don't rationalize. Don't assume. Don't say it could never happen to me. Still not convinced? Think about the crew of CRAB 21.

It's never THE END for safety.



Presently a special operations flight test loadmaster, Sergeant McClain participated in both the Iranian rescue attempt and Urgent Fury. Sergeant McClain is a frequent writing contest winner.

LANDING ILLUSIONS



By Maj. Gene Miller
375 MAW/DOM

The old adage that "seeing is believing" can get you in trouble in an aircraft. This may seem a bit startling since seeing and believing flight instruments is one of the most important disciplines of instrument flying. So what am I talking about?

I'm not talking about instrument flying. I'm discussing the visual flying we do when we land the aircraft. Just after acquiring a runway, we change our focus from inside the cockpit to the runway environment. That often becomes the most critical part of the entire flight.

We know visual illusions can create problems in landing. Flight publications such as AFM 51-37 do a credible job of describing possible landing misperceptions, but they don't really tell us how extensive the illusions might be or what to do about them.

Airfield Lighting Working Group

My familiarity with this problem originated with an interagency group called Airfield Lighting Working Group. This group was founded several years ago to investigate issues relating to approach lighting and was chaired by the Instrument Flight Center. I attended as an Air Force flight inspection representative.

One of the group's early recommendations was to emphasize training. When you think about it, there really aren't many training tools available to us. Simulators don't stop a mile from the threshold so we can see how the configuration of a lighting system appears from a particular vantage point; nor are we normally offered the opportunity to make many approaches to different size runways or runways with non-standard lighting systems.

System Program

I left the February 1990 meeting determined to develop a simulation program for a personal computer. My objective was to show the feasibility of such a task—how real could it be, would it be fast enough to hold interest, and could different lighting systems and runway sizes be effectively portrayed?

My efforts were rewarded. I scaled the program so the computer screen would represent a window, 18 inches in front of the pilot's eye with the top of the screen at eye level. This projection simulated the exact view we have when approaching a runway. By changing the observation position (i.e., aircraft location), I could move this view closer or farther from the runway, as well as above or below the glide path.

My first reaction to the projection was, "the runway sure is small." At five miles, the runway was a small grouping of dots. At a mile and a half, it was more defined, but the 150-foot-wide runway still

projected an image only 0.3 inches wide!

Not only did this show how well our eyes resolve objects, but it also pointed out the narrow range of information available for making critical landing decisions. I discussed this nighttime project with the wing safety officer. He suggested it might be valuable to compare two runways at the same time. I decided to display a reference runway on the screen. This turned out to be a most useful research tool and ultimately led to this article.

The Big Illusion

Suppose we operate from a runway with different dimensions than the one we most often use. Our eyes have been trained to recognize the larger runway outlines as the normal situation. We get quite good at detecting elevation angle changes and distances from the runway. In pilot training they said, "We educate your eye." How well *can* we realistically educate our eyes? Consider a situation where we choose a 200-foot wide by 10,000-foot long runway as the normal runway at home base. We then simulate flying into a runway half as big—100 wide and 5,000 feet long. How will our trained eye perceive this situation?

Without too much thinking, one could guess that a runway half as big would appear twice as far away; that is precisely what the computer shows. This means we can't rely on our eyes to tell us how far from the runway we really are. For example, when we believe we are one mile away, we are really at one-half mile since runway outlines are identical. What are the implications? We can overcome this illusion on a long final if we have DME to tell us how far we really are from the runway.

Illusions on short final are another matter. If we emerge from the clouds and suddenly find ourselves approaching the landing phase, we may tend to relax a bit since the runway doesn't appear so close. If we are not careful, we may find ourselves late in initiating the flare.

Altitude

One more point needs illustration. What about altitude? The same rule for distance applies to altitude. Considering the same runways as before, you will seem to be twice as high as you really are. You may contact the runway sooner or may not flare at all.

Fig. 1 helps illustrate this perspective. Imagine your eye at the top of the pyramid. You cannot tell the difference between a 200-foot-wide runway that is 100 feet below you, and a 100-foot-wide runway only 50 feet below you. Of course, we aren't normally as easily confused in daytime since other clues tell us how high we really are—the apparent size of the runway lettering, or vegetation near the runway, for example. Nighttime confuses us because we can't readily see these objects.

We're All Suckers

Now, let's look at a different problem—one more insidious. If we position the aircraft to agree with the image in our eye educated from home base, where will we be on a shorter runway?

Using the previous example, we would really be at one-half mile when we thought we were at one mile. The same applies for altitude. We would think we are at 370 feet when we actually are at 185 feet.

How high above the threshold elevation should we be for a 3-degree glide path? How about 211 feet? Hence, our educated eye has put us 26 feet lower than we would like to be.

Does this illusion remain constant as the distances increased? Yes. In fact, the same thing happens at the threshold. Calculations show you will cross the threshold at one-half the height you are planning.

The implication could be disastrous when flying a large aircraft. As your aircraft approaches the runway, you do not realize how close you are to the runway and may cross the threshold considerably lower

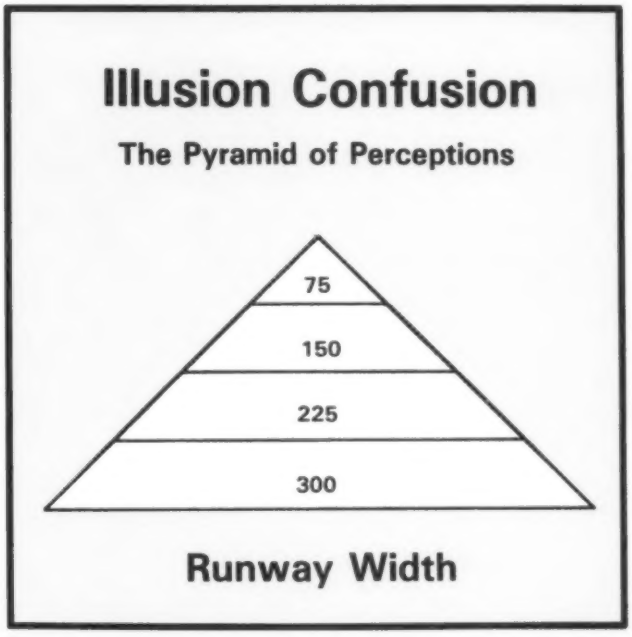


FIG. 1

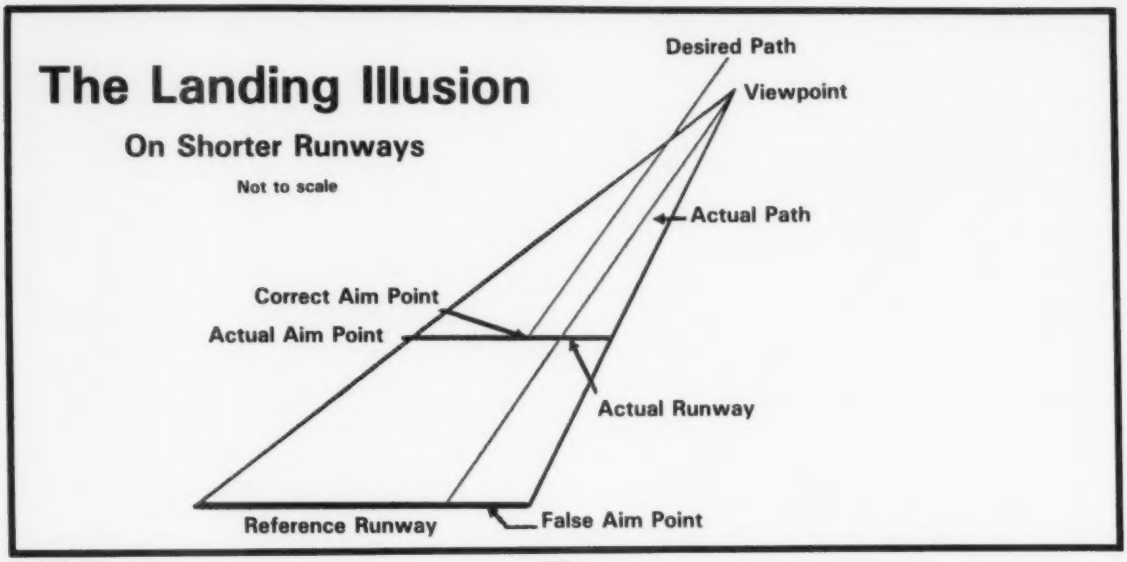


FIG.2

than planned. Touchdown could even occur prior to the threshold (if the wheels are more than 27 feet below the pilot's eye for a 54-foot threshold crossing height)—rather a sobering conclusion.

The Reason

Further analysis shows the real reason for the problem is that we pick a false aim point—one that seems to be 1,000 feet down the runway, but is really half that distance.

Fig. 2 shows why we do this. Since we still have the reference runway in our mind (and we need it or we would forget how to land the airplane), we unconsciously pick an aim point 1/10 of the distance from the approach end of a 10,000-foot long runway. Since the actual runway is much shorter, 1/10 of it may be an undesirable aim point. In the above example, it would be only 500 feet.

The Rule

The general rule is that the projected threshold crossing will be reduced by the fractional reduction in runway size. In the example above, the runway was half the size of the reference runway, and the threshold crossing height was reduced by one-half, from 54 feet to 27 feet. A runway one third less than of your normal reference will lure you into crossing the threshold at 18 feet; 36 feet below desired.

The same relationship holds for the aim point. What can be done about this? Flying a precision approach helps if we don't make last-minute pitch changes.

What about using VASI? Unfortunately, the near light in a VASI is aimed at 2.5 degrees and is too close to the threshold to give a red/red indication. You will still see a red over white indication.

What you can do, however, is pick the aim point between the two lights. That will give you some indication of the correct distance, since the lights should be mounted 600 and 1,300 feet from the threshold.

A PAPI visual glide slope system is more helpful since there is more definition to the system and a common location for the lights. In the above situation, the PAPI would indicate three red lights and one white light, indicating slightly below path. The light location would also be useful in picking the aim point since the lights should be mounted at a normal touchdown point.

Summary

Until someone develops hardware to tell us how far above and from the end of every runway we are, we will be susceptible to visual illusions.

Solutions include: first and foremost, correctly identify the runway threshold. It's impossible to pick the visual aim point correctly if the end of the runway is not distinct.

Use the visual glide slope indicators to their best advantage. If there are none, realize you may be aiming short of the touchdown point.

Don't get caught short on shorter runways. Trying to land short to prevent running off the end could mean double jeopardy. If anything, plan for a slightly longer touchdown. This should leave your tail feathers unscratched.

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MSgt. JohnM. Ovitt
MSgt. John M. Sigman
MSgt. David R. Williams
TSgt. Dianne L. Deruntz
TSgt. Caryl A. Hathaway
TSgt. Cedric W. C. Johnson
TSgt. Mark E. Schooling
TSgt. David H. Taketa
TSgt. William E. Watts
SSgt. Frank R. Truex

345 TAS
Lt. Col. Edward J. McClure, Jr.
Maj. Van J. Hammack. Jr.
Maj. Kenneth C. Lambert
Maj. Douglas L. Miller
Maj. James A. Odell
Maj. Bruce A. Razer
Maj. Ernest V. Woollard
Capt. Gregory W. Botbyl
Capt. Richard J. Dieringer
CMSgt. Buddy R. Liston
MSgt. Donald L. Kelley
MSgt. George R. White
TSgt. Charles P. Shelton, Jr.
SSgt. Thomas V. Nugent

356 TAS
Capt. William W. Avery

375 MAW
Capt. Gary W. Wildermuth

443 MAW
Capt. Thomas R. Kettler

1375 FTS
Capt. Douglas A. Farnham
Capt. Stephen H. M. Gillen
Capt. Gary D. Gray
Capt. James D. Kellim, Jr.
Capt. George J. Raines

1400 MAS
Capt. Patricia Bomberger

1402 MAS
Capt. Jean M. Swanson

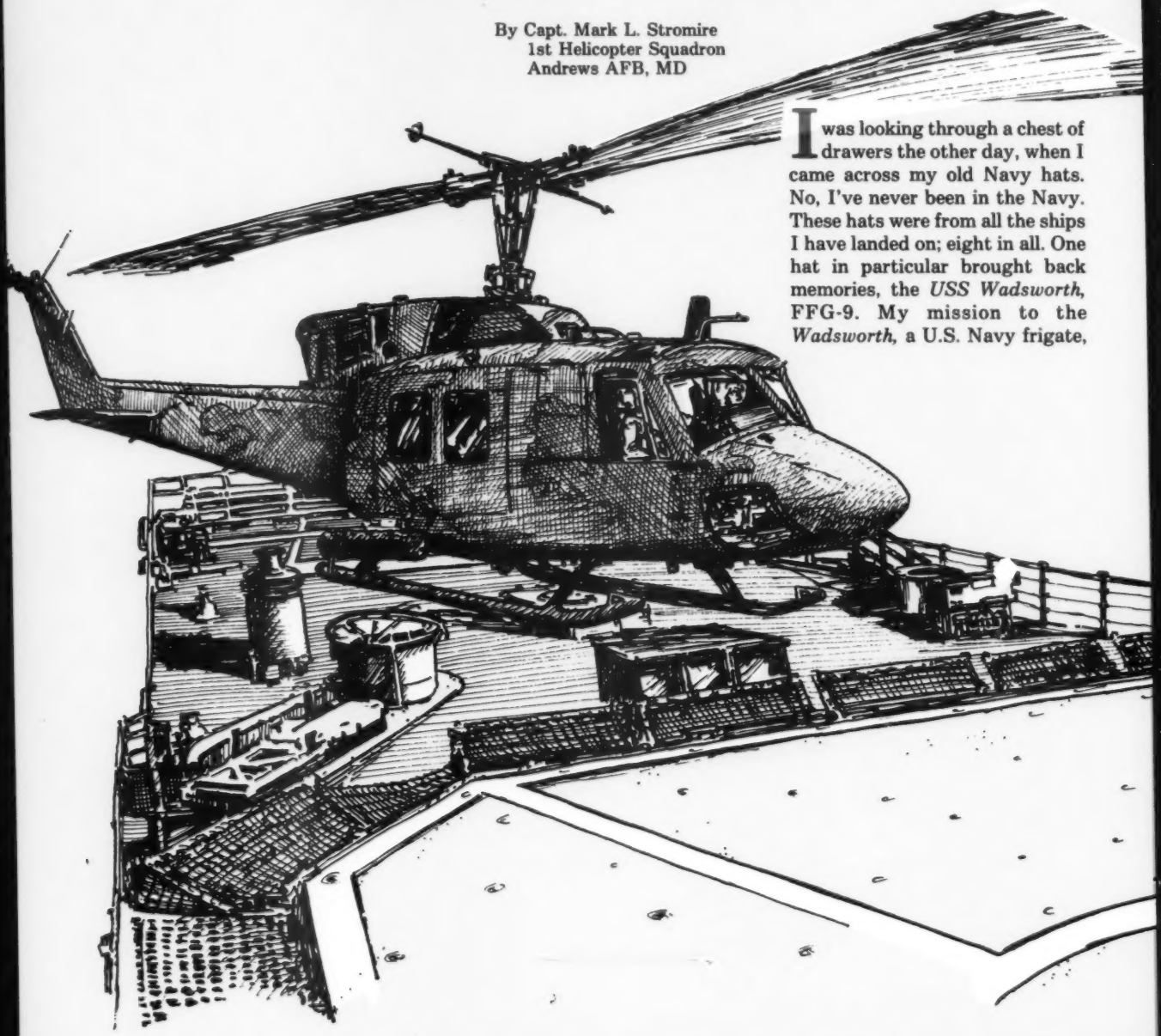
Det 1, 1402 MAS
Capt. Brett O. Brinkley

Ranks and units are those at time of award.

110 P.S.I.

A cryptic message is no message at all.

By Capt. Mark L. Stromire
1st Helicopter Squadron
Andrews AFB, MD



I was looking through a chest of drawers the other day, when I came across my old Navy hats. No, I've never been in the Navy. These hats were from all the ships I have landed on; eight in all. One hat in particular brought back memories, the *USS Wadsworth*, FFG-9. My mission to the *Wadsworth*, a U.S. Navy frigate,

was one of the most fulfilling, yet terrifying, of my helicopter flying career.

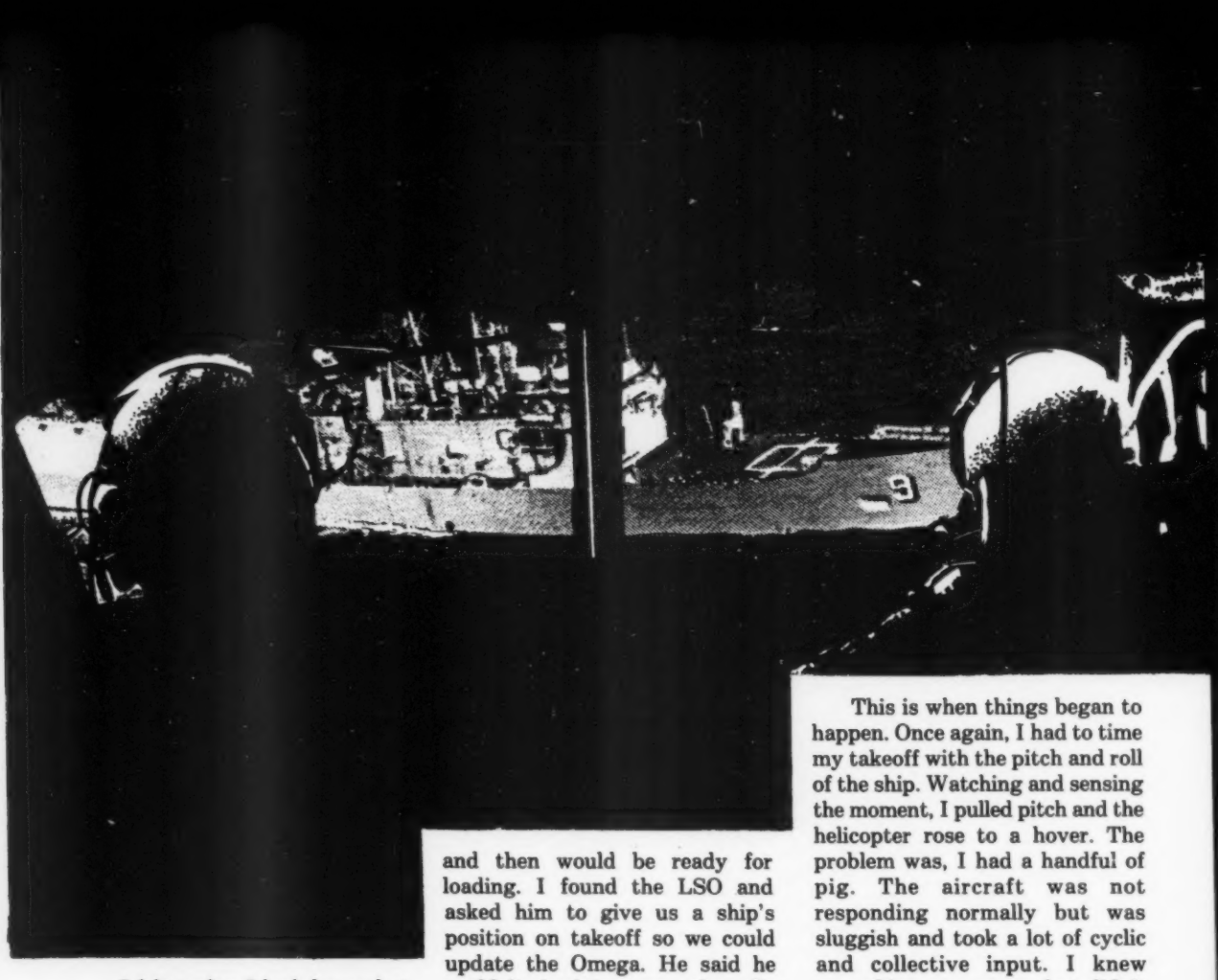
Six years ago I was assigned to Det 1, 2d Air Division, a special operations helicopter unit at Howard AFB in the Canal Zone. A high value shipment had come through the Panama Canal the night before and our choppers had been tasked with hot strip alert. The crews had spent the better part of the night waiting around in case any trouble went down requiring our UH-1N's rockets and guns. As it turned out, the transit by the cargo vessel and its Navy escort had gone without a hitch. Our alert crews were burned out however, from having stayed up most of the night.

The afternoon of the next day, the Rescue Coordination Center received a call from the Navy escort, the *Wadsworth*, stating they had a crewman with acute appendicitis on board who needed to be medevaced to Gorgas Army Hospital in Ancon. Everyone with deck landing qualification under his belt was in crew rest except copilot 2d Lt. Kevin Hooper; flight engineers TSgt. Al Allshouse and SSgt. Bob Tipton; the med tech, Sgt. Tony Barria, and me. I hurried down to the command post and got the lowdown on the situation from the RCC controller. He gave me the ship's position, course, estimated speed, patient's condition, etc. We discussed other details including communications and alternate airfields. What stands out in my memory was the controller saying we could land on the ship, that fuel was available on board so we could make the trip back without stopping, and that a P-3 was in the air for communications support.

With this information in hand, I went down to the det and started getting everything together for the mission. I asked maintenance to install a forward auxiliary fuel tank in the helicopter alcove. A check of NOTAMS showed nothing affecting us, and weather didn't have much to say except that their ability to see what was out to the west was limited. The det commander, DOV, and I discussed some options to keep in mind during the flight. After everything was planned and coordinated, we briefed and left.

As we took off, we swung over the TACAN station to update the Omega nav system with a known accurate position and proceeded west. The first hour was uneventful and we were soon approaching the Azuero Peninsula, a mountainous appendage extending south from the main part of the Isthmus of Panama. Strong, warm, moist winds from the south were striking the mountains of the Azuero and creating towering cumulonimbus clouds. We tried to go north to keep our feet dry in case we ran into any trouble. The storms extended well north so we turned south out over the Pacific. As we proceeded south, we caught a small rain shower and something got wet—we lost the number two generator. Normally, I would have turned back but we had an important mission. Since we still had a good generator and a battery to get us to either the ship, Santiago or Rio Hato, or at least to an open area along the Inter-American Highway where maintenance and fuel could get to us, I kept on. The P-3 was talking to us as we rounded the southern edge of the storms and the Azuero Peninsula. Flying west, we could see only water and the darkness of the storm off to our right. After a half hour of this, the P-3 called to say we should be picking up the ship's "father." Hoop and I looked at each other wondering what the hell he was talking about. We were supposed to pick up a young seaman, not someone's dad. Just then, I looked down to see the TACAN receiver had locked on to the ship's TACAN station and was giving a good bearing and distance to fly. I figured the P-3 meant "father" was TACAN, and reported we had the "father." Less than 20 minutes later, we had the *Wadsworth* and its charge in sight. We radioed we were approximately ten minutes out and wanted five hats. Our unit's tradition was to get hats from each ship we landed on and we figured we were going to earn these.

I made a low pass over the ship to orient myself with its approaches, obstacles, and how to make a break should I get waved off or decided to go around. As we turned downwind, the ship reported a green deck and a speed of 20 knots. I asked them to give me ten knots and they soon reported they had throttled back to what I had asked. I turned base to final and set up for the approach. The crew was briefed, the "Before Landing check" completed, and it was down to me. On short final, Hoop waved his arm out the left window so the LSE (marshaller) knew which seat was flying and where to position himself on the deck. As I came in over the deck, I picked up the turbulence of the superstructure and ground effect of the deck, as I had anticipated. I hadn't anticipated such a small confined deck area though, and the ship was definitely pitching and rolling in the ocean swells. I stabilized my hover over the moving deck as I watched the horizon, the LSE, and the hangar deck doors in front of me. I waited to time my touchdown for just the right moment. Sensing the moment, I dropped the collective and planted the chopper on the deck as the ship crested a wave. The deck guys immediatedly had my skids chained and we shut down.



I felt cocky. I had done what few Air Force "one LTs" had ever done—land a chopper on a frigate's helo deck. Now, we had to get the patient to Gorgas—but first things first. We had to gas up and get off the deck or we would be going for a long cruise— and this was not the Love Boat. I talked with Bob and told him to make sure we used as much of our legal weight as possible for gas. We still had to get back around the storms we had run into on the way, plus we had further to go this time to get to Gorgas. In addition, each minute we stayed on the ship took us further from Gorgas.

Next, I went inside the hangar deck where the ship's medics were waiting with the patient. He was semi-conscious in his litter, with the ship's doc looking after him. I told the doc we needed to gas up and then would be ready for loading. I found the LSO and asked him to give us a ship's position on takeoff so we could update the Omega. He said he couldn't give it to us over the radio but would pass it on at engine start.

After inspecting the plumbing, I went back up on deck and checked to see how everything was going. The engineers had finished refueling and Tony was getting a briefing on the patient. As we watched, we discussed how we were going to get off the deck and get home. Takeoff data hadn't changed much; we would have adequate power on takeoff.

Shortly thereafter, we were saddled up and ready to go. Engine start was good, but we still couldn't get number two generator on line. Hoop brushed his sleeves to signal we were ready for them to pull the chains. The LSE waited till everyone was clear and the deck was green before he motioned us into the air.

This is when things began to happen. Once again, I had to time my takeoff with the pitch and roll of the ship. Watching and sensing the moment, I pulled pitch and the helicopter rose to a hover. The problem was, I had a handful of pig. The aircraft was not responding normally but was sluggish and took a lot of cyclic and collective input. I knew something was wrong but didn't know what.

I had to decide whether to put it down or fly it. The deck beneath and the superstructure in front of me were moving as the ship crossed the ocean waves. This meant the ground effect and visual references were unstable, causing me to wander. The hangar deck doors were only about 12 feet from the blade tips and the LSE was halfway between the tips and the doors. Putting it down would be real tricky. If I over-controlled, I might bang into the metal in front of me, take off the LSE's head, or go waltzing across the flight deck. The sluggish control response, the ship's movements, and the nearness of too many things made me decide to fly out of it.

I started a slow climb to get above the hangar deck doors and

the LSE. Next, I put in left pedal so I could turn the nose left, out to sea, and still keep all obstacles on my side where I could see them. As I turned, Hoop called 103 percent on the torque. I let out some of the torque to get back in limits but that stopped my climb. Seeing clear ocean now in front of me, I nosed it over to pick up airspeed. As I went over the side, I lost the ground effect of the deck and began to settle toward the white caps. I looked down at the airspeed but it hadn't come off the peg yet. Looking up, the water was getting closer. The airspeed needle was just now quivering . . . water was even closer . . . airspeed was climbing. The froth on the white caps was now distinct. My heart was pounding. Airspeed was 20—enough to climb.

I know I must have only pulled back a little on the stick but it seemed like I had buried the coolie hat in my navel. We lumbered up into the air and the wave caps started getting smaller. After reaching about 50 feet, I put the nose back down and assumed a normal climb-out. Soon we were heading east toward Ancon and the hospital.

The rest of the crew let out their collective breath. Hoop and I tried to figure out what had happened to make our job with the Navy an adventure. He thought maybe the hot exhaust from the ship's stack had caused an extra high density altitude bubble around our aircraft as we hovered on the fantail. I thought maybe superstructure turbulence had created extra dirty air around us. Nothing could really explain it, though.

The reason became apparent as we flew east. The forward aux tank should only have had a half-hour's worth of gas in it. After half an hour, the forward aux tank in the left alcove was still pumping. Forty-five minutes later it was still going. This tank was worse than the Eveready Rabbit because it just kept right on going. Better than an hour later, it finally went dry and we switched to the aft aux.

Turning to Bob, I asked how much gas he had put in the thing. He said probably about 50 gallons but wasn't so sure now. The 130-gallon tank doesn't have a quantity gauge so before he started filling it up, he asked the seaman running the pump to tell him when he got to 50 gallons. The seaman replied, "110 psi." Bob said he thought this was the seaman's way of acknowledgment and went on filling the tank. As he filled it, he asked the seaman again, "You'll tell me when we get to 50 gallons, right?" "110 psi" was the reply. After what Bob thought should have been sufficient time to get to 50 gallons, he asked the same question."110 psi" was the reply again. Exasperated by the seaman's apparent ignorance, Bob said he pounded his fist on the rubberized side of the tank and figured it was just under half full. He terminated the refueling and the Navy guys packed up the hose. Everybody then worked to get the patient on board.

In reality, the tank was almost completely full, with over 100 gallons, and we had been extremely overweight. That accounted for the sluggish performance, the extra power required to get off the deck, and our near-brush with the sea. That still didn't account for the miscommunication between Bob and the seaman running the refueling pump. That would be explained later.

On the way back, we found the storms over the Azuero had cleared up so we made a beeline across for Gorgas. We maintained Vne and arrived at Gorgas' helipad as we came out of warp. The ambulance was there to meet us, and I gave a thumbs up to our patient as they trundled him away from the chopper to meet his destiny under the knife. He looked back and gave a weak but definite thumbs up.

Explanation for Bob and the seaman's miscommunication came two days later as I tried to reconstruct it all by going over what had happened and read the Navy's HOSTAC. The HOSTAC is like a VFR or IFR Supplement that lists ships instead of airports. There was a little note in the back of it saying that most ships don't have the capability to read delivered fuel in gallons. Instead, each ship entry in the HOSTAC lists a fuel hose pressure in pounds per square inch and fuel flow rates in gallons per minute at that pressure. It's up to the refueler to determine how many gallons have gone into the tank by either using a fuel gauge, a dipstick, or by looking at his watch and doing some simple math. None of us had researched fueling aboard ships to know this. We assumed gas was always read in gallons at the pump. The seaman had no way of knowing we didn't understand Navy peculiarities well enough to comprehend what he meant by "110 psi." By the way, for the *Wadsworth*, 110 psi gave a rate of 50 gallons per minute out of the particular pump used by the seaman.

If you ever find yourself working with another service, heed our example. We were ignorant of their terminology and their methods. If you don't understand something, say so. Yeah, they may be a little smug in that they know something you don't. Then again, I would have preferred smugness rather than go through what my crew and my aircraft went through by not asking the seaman what he meant by "110 psi."

Lt. Col. Mike Luckenbach and Capt. Dan Norman preflighting their aircraft.

The C-5 Galaxy

If Orville and Wilber could only see us now.

By Maj. Dale Van De Ven
Associate Editor

It was over 50 miles from the front gate of Dover's 436th Military Airlift Wing, yet it was already evident what the C-5 Galaxy was all about. The closer the airport shuttle got, the more frequently we would pass another 18-wheeler, hauling a flatbed loaded with built up cargo pallets ready for shipment—and shipping cargo is what the C-5 does best.

The C-5 Galaxy is the Free World's largest aircraft. Almost as long as a football field, the top of its T-tail extends six stories into the air and boasts a usable cargo compartment 121 feet long, 19 feet wide, and 13.5 feet high—about the size of an 8-lane bowling alley.

The C-5 is specifically designed to transport all types of military fighting equipment and associated personnel. It's the only aircraft that can transport virtually any piece of Army equipment, including the 74-ton mobile scissors bridge. Some of the cargo carried by a C-5 might include: eight F-5 fighter planes (complete), or two M-1 battle tanks, or seven UN-1 "Huey" helicopters (complete). Put into civilian terms, it is capable of handling 6 standard Greyhound buses, or your choice of 48 Cadillacs, 90 Mercedes, 106 Mustangs or 128 MG Midgets.

The Galaxy can be loaded and off-loaded at the same time using front and rear cargo openings. A visor nose and a rear door, each with full-width ramps, open to expose the full height and width of the cargo compartment. This allows drive-through loading and unloading of wheeled and tracked vehicles, and faster and easier loading of bulky equipment. A "kneeling" landing-gear system lowers the aircraft's cargo floor to truckbed height. The entire cargo floor is equipped with a roller system for rapid handling of palletized equipment. A full load of 36 pallets can be placed aboard in about 90 minutes.

Four General Electric TF39-GE-1C turbofan engines power the C-5. Each engine pod is nearly 27 feet long, weighs 7,260 pounds, and has an air intake diameter of more than 8.5 feet. Maximum fuel load for the C-5's 12 wing tanks is 332,500 pounds, or 51,000 gallons. That's enough JP-4 to fill six and one half railroad tank cars, or the average five-room house. The fuel weight alone of a Galaxy nearly equals the total weight of a C-141 Starlifter!

The upper deck crew compartment can accommodate a crew of six, a relief crew of seven, and eight additional crewmembers. Work stations are provided for the pilot, copilot, two flight engineers, and two loadmasters. The upper deck's forward and rear compartments include a galley area as well as lavatory. In addition, two separate sleeping compartments, each with three bunks, are provided.

Student Loadmaster A1C Brian Hill checks the flight's weight and balance.

An automatic troubleshooting system constantly monitors more than 800 test points in the various subsystems of the C-5. The Malfunction Detection, Analysis and Recording System uses a digital computer to identify malfunctions in replaceable units. Failure and trend information is recorded on magnetic tape for analysis.

The Galaxy has sophisticated communications equipment, a triple inertial navigation system, and can operate without ground-based navigational aids.

The first C-5A was delivered to the Transitional Training Unit at Altus AFB OK in December 1969. The first operational Galaxys were delivered to the 437th Military Airlift Wing, Charleston AFB SC in June 1970. In December 1984, the 433d Tactical Airlift Wing (now the 433d Military Airlift Wing) at Kelly AFB TX became the first Air Force Reserve wing equipped with C-5 Galaxys. There are nearly 130 C-5A and B aircraft in the Air National Guard, Air Force Reserve, and active duty forces.

Enough C-5 Galaxy fun facts. After finding appropriate background information on the aircraft, I felt the most reasonable thing to do would be to talk to a few crewmembers and find out what it's like to fly the C-5.

The first person I talked to was Capt. Richard Burke, a 436 MAW flight safety officer. Captain Burke is a former OSA pilot whose prior experience is in T-39s and C-21s.

"Flying the C-5 was a little hard for me at first, since I was used to the two-engine mentality. In a C-21, when you lost an engine, you landed right away. In a C-5, you may well cruise on for another five hours, so my thought process needed a little modification.

"The mission is quite a bit different. Carrying cargo instead of DVs, I thought we could go where ever we wanted. That's not true. There's a lot to be considered, and much of that has to do with the size of the airplane.

"When flying C-21s I was home almost every night; we flew one-day missions. In Big MAC you're gone for days. It's more fun for me; I like to travel and it's nice to be able to see other countries.

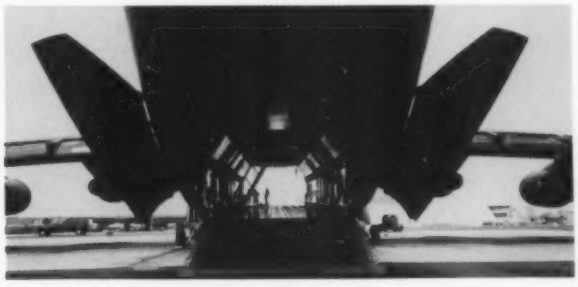
"Another difference is in Command and Control. In OSA you're given a mission cut in the morning and you do just that. You only call in by exception. In most of MAC you report-in every time you're down. The decision you make isn't always the one you thought you would take. In OSA, I flew dignitaries and was given free rein. I made a decision and we talked about it on the ground. In the C-5 world, it's more of a combined decision. You don't feel like you own the airplane as much. Before, it was more like I owned the jet . . . now, I'm just renting.

"Being a C-5 aircraft commander presents a new set of considerations. I was used to just me and another guy. All I had to control were a few passengers, which was never a problem. Now I have 10 or 11-man crews and have to keep track of all the individuals and make sure their needs are met. The NCOIC program works well, but a lot of the burden still falls to the AC. He's got to make sure everything gets done.

"This is the most challenging leadership job I've ever had. Sometimes we don't get the chance to do that in MAC. We manage, but don't lead. It's a challenge to be able to get the crew to do what you want them to do. That's the biggest difference right there—actually commanding more people than just one guy."

The next pilot I talked to came from C-130s. Maj. Curt Morris, another 436 MAW flight safety officer, had his own viewpoint on flying the C-5.

"When I work with the C-5 I think in multiples of six. A C-130 can carry 6 pallets where-



As wide as an eight lane-bowling alley.

as a C-5 will carry 36. A C-130 has 4 tires on the back, 2 on each side, and a C-5 has 24 on the back—12 on each side, 6 per bogey, with 2 bogeys per side. In the C-130, you could get total fuel consumption down to less than 4,000 pounds per hour. The C-5 is doing well to approach 24,000 pounds per hour. You can carry six times more cargo, but you spend six times more fuel. The payback is you can get the cargo there in a shorter time, and you can carry outsized cargo—the really weird stuff you wouldn't even think about putting on a C-130.

"You can't predict where the tail or wing tip are going to go."

"The actual ground maneuvering of the plane is an incredible job. The aft bogeys 'caster'—they swing out. That does a couple things for us. It allows us to make a much shorter turn, but the tail doesn't swing out in a perfect circle. You can't predict where the tail or wing tip are going to go. When you hit caster, the wing tip is actually going to swing outside of a perfect circle. That's how most wing tip or tail incidents occur.

"Command and control have a different mentality toward the C-5. The plane is a lot more visible and more people want to know what you're doing. One nice thing about the C-130, people didn't bother you much. You'd say 'yeah, we're going here, we're going there,' and they'd say 'Fine, just call us when you get there and tell us what you're doing the next day.' It's not quite that way in C-5s.

"In a C-130, I'd say 'Hey, I need to drop in here for whatever reason' and normally it would be no problem. In a C-5 they'd say 'Ahh, excuse me, wait a minute, we've got restrictions against that. They don't want you in there because you would close their whole runway. You have to consider more when you're driving a C-5.

"I miss the assault landings we did in C-130s, but on the other hand, now I'm aerial refueling qualified and that's something I really enjoy that we didn't do in C-130s. It's really a challenge to be able to put together an operation like refueling—to be able to plan it and make everything happen, and deal with all the unexpected things that come up. You're dealing with different kinds of airplanes, from different locations and different commands. Generally, you meet a tanker that took off from a different country than the one you did."

The last pilot I talked to, Lt. Col. Mike Luckenbach, 9 MAS/DOV, expressed concern for ground operations, but also added some new points.

"C-5s are totally different. A lot of people don't realize you can't treat a C-5 like other aircraft. It takes time to understand that, because of its size, it doesn't perform like a normal airplane, especially on the ground. When you taxi, you've got 111-plus feet of wing sticking outside the aircraft, about 8 feet of which you can't see. You really have to be careful, especially now that we're taxiing around places we haven't been before and some have never been surveyed for C-5 activity.

"I came from ATC and T-43s. It's a nice little airplane and you've got your schedule a month in advance. It didn't take the 11 years I've been in MAC to realize in the C-5 world you live by the telephone. The next time it rings, you might be gone for two weeks. It's a totally different lifestyle."

Colonel Luckenbach then added some additional concerns that have been highlighted as a result of Operation DESERT STORM.

"The big thing is being gone so much, which really raises the stress level. It's harder at home since you're seldom there. When you get home, you've got a broken washing machine, a car that doesn't work, a refrigerator that's leaking, and it never ends. You get out in the system and you're sometimes scheduled to fly airplanes you shouldn't fly and you have to tell people 'no'. One thing I'll say for command and control, so far they haven't argued with a decision I've made as far as whether or not to take an airplane—which is the way it should be.

"The best thing about the C-5 is working with aircrews. Everybody is out to do the mission, do it right, and get the airplane back in one piece."

All in all, the C-5 is a pretty impressive airplane. As of 25 February the C-5 DESERT STORM inter-theater airlift participation totals were 3,528 missions, 86,580 passengers and 213,780 tons of cargo. When you consider that the Wright Brothers' first flight was 120 feet—one foot shorter than the Galaxys' cargo compartment—it makes you realize just how far we've come. ★

TMF Instrument Quiz

An ILS Circle

San Diego approach control informs you that runway 18 is in use at North Island and to expect the ILS-A. The ceiling is 700 feet, visibility is 2 statute miles, and you are flying a category "C" aircraft.

The folks at the Instrument Flight Center at Randolph AFB TX want you to know this approach plate, as printed, contains errors. One is the MEA from SARGS to GATTO; it's really 2,000 feet, not 2,500 as published. A second error is the distance shown from SARGS to GATTO in the plan view is the DME from I-SAN; not the mileage from SARGS to GATTO.

1. Circling procedures and techniques are not compatible with precision approach criteria and, under normal circumstances, should not be attempted.

   a. True.
   b. False.

2. ATC instructs you to proceed direct to Mission Bay (MZB), thence to GATTO for holding. How far in advance should ATC issue specific holding instructions?

   a. 3 minutes.
   b. 4 minutes.
   c. 5 minutes.
   d. 6 minutes.

3. Consider yourself conveniently aligned for the teardrop course when aircraft heading is within plus or minus 45-degrees of the selected teardrop course.

   a. True.
   b. False.

4. At GATTO, course guidance is available to fly the teardrop course.

   a. True.
   b. False.

5. You are level at 2,500 MSL over GATTO and heading 238-degrees when ATC clears you for an immediate approach. When can you descend from the procedure turn fix altitude?

   a. Inbound to GATTO if established on a segment of the approach.
   b. Initiate descent when established on a parallel or intercept heading and outbound from the IAF in relation to outbound penetration course.
   c. Descend from the procedure turn fix altitude when the aircraft is outbound abeam the procedure turn fix.
   d. Descend from 2,500 feet 4.4 nautical miles prior to the ILS glideslope.

6. From GATTO to runway 18 at North Island is approximately _____ nautical miles (nm).

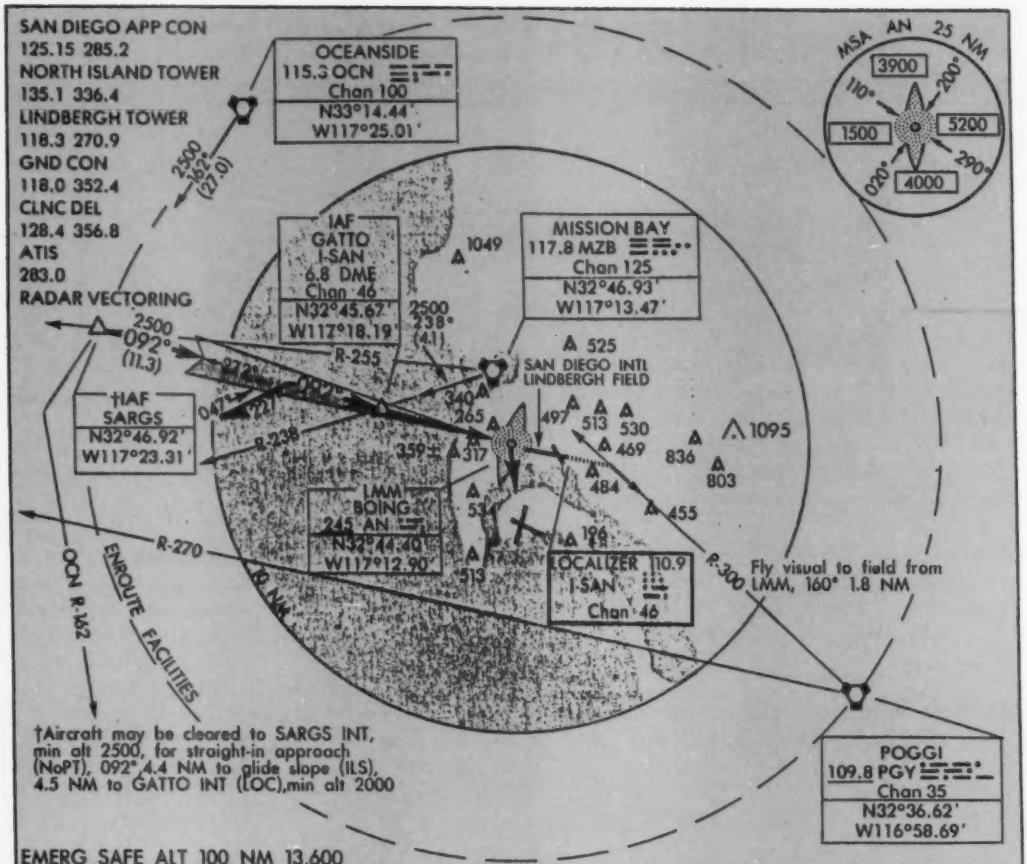
   a. 10.0 nm.
   b. 1.8 nm.
   c. 6.5 nm.
   d. 6.8 nm.

7. GATTO is 6.8 DME from _____.

   a. MZB.
   b. AN.
   c. PGY.
   d. I-SAN.

8. Where is the 10 nautical mile "remain within" distance measured from?

   a. MZB.
   b. Boing.
   c. GATTO.
   d. SARGS.



CATEGORY	A	B	C	D
CIRCLING*	620-2 594 (600-2)			780-2½ 754 (800-2½)

*CAUTION: Obstructions on Pt. Loma to 534' within 1.4 NM W of field. Maneuvering for circling approach not authorized W of Rwy 18–36 centerline. Approach authorized for Rwy 18 or left-hand approach to Rwy 29 after flying down Rwy 18.

**ILS Glide Slope passes through MDA .88 NM prior to LMM (approx 3.1 DME), 3.82 NM after passing GATTO INT.

ILS-A

32°42'N-117°13'W

185

SAN DIEGO, CALIFORNIA

NORTH ISLAND NAS (HALSEY FIELD) (KNZY)

9. After reaching MDA and the missed approach point, where should the pilot not flying the aircraft look for the landing runway?

a. 12 o'clock.
b. 9 o'clock.
c. 3 o'clock.
d. 6 o'clock.

10. When executing the visual segment, remain clear of clouds and proceed to the airport, maintaining visual contact with the surface.

a. True.
b. False.

11. A contact approach will only be authorized when requested by the pilot and reported ground visibility at destination is at least:

a. 1 statute mile.
b. 2 nautical miles.
c. 3 statute miles.
d. 3 nautical miles.

12. To fly visually to North Island from Boing (AN), you fly 160-degrees. This is a:

a. Suggested heading.
b. Course from AN.
c. Dead reckoning course.
d. None of the above.

13. The circling approach obstruction clearance for a category "C" aircraft is:

a. 1.5 nm.
b. 1.7 nm.
c. 2.3 nm.
d. 4.5 nm.

14. Circling west is authorized for runway 36.

a. True.
b. False.

15. The highest obstruction shown is:

a. 1,049 feet.
b. 836 feet.
c. 1,095 feet.
d. 1,949 feet.

16. During the visual segment, the pilot should have preplanned climbout options based on aircraft performance and terrain features.

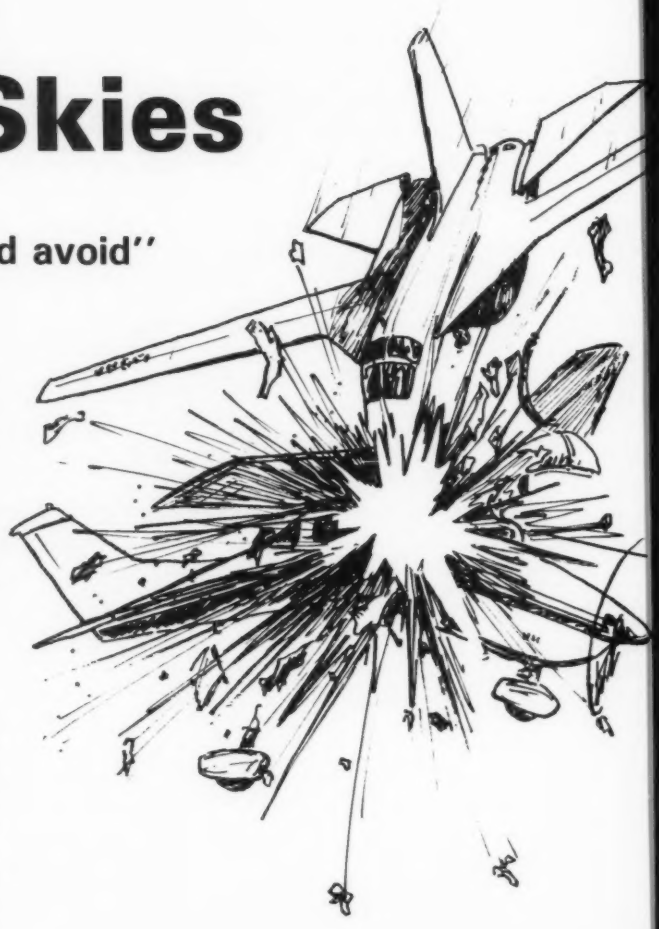
a. True.
b. False.

THE ANSWERS

1. a. True. Circling procedures and techiques are not compatible with precision approach criteria, and under *normal* circumstances, should not be attempted. Terrain and obstructions on Point Loma, west of North Island and San Diego, require the use of an ILS to safely reach circling altitude. (AFM 51-37, para. 14-6a.)
2. c. 5 minutes. ATC should issue holding instructions at least five minutes before reaching a clearance limit fix. If holding instructions have not been received upon arrival at the fix, hold in accordance with procedures in FLIP. (AFM 51-37, para. 9-4d.)
3. a. True. Consider yourself conveniently aligned when your aircraft heading is within plus or minus 45-degrees of the selected teardrop course. (AFM 51-37, para. 9-5a(3).)
4. b. False. Course guidance is not available from this fix. If course guidance is available, attempt to intercept the selected teardrop course outbound. (AFM 51-37, para. 9-5a(3).)
5. c. Descend from the procedure turn fix altitude (published or assigned) when the aircraft is outbound abeam the procedure turn fix. If you cannot determine the abeam position while in the turn, start descent after completing the outbound turn. (AFM 51-37, para. 12-2e.)
6. c. 6.5 nautical miles. (Instrument Approach Procedure (IAP), profile view.)
7. d. I-SAN. (IAP, plan view.)
8. c. GATTO. Remain within distance is measured from the procedure turn fix unless the IAP specifies otherwise. (AFM 51-37, para. 12-2c.)
9. c. 3 o'clock.
10. a. True. (AFM 51-37, para. 13.5a.)
11. a. 1 statue mile. (AFM 51-37, para. 13-4.)
12. c. Dead reckoning course. The depicted ground track associated with the visual segment should be flown as a dead reckoning (DR) course. The DR course should be flown as closely as possible to a depicted ground track. Use lead points for turns to and from the DR leg so as to roll out on the depicted ground track. Attempt to fly the ground track by correcting for wind. (AFM 51-37, para. 13-5. and 11-6.)
13. b. 1.7 nautical miles. (AFM 51-37, Fig. 16-3.)
14. b. False. Maneuvering for circling approach is not authorized west of runway 18-36 centerline. (IAP, Caution.)
15. c. 1,095 feet.
16. a. True. Missed approach obstacle clearance is assured only if the missed approach is commenced at the published MAP or above the MDA. The pilot should have preplanned climbout options based on aircraft performance and terrain features. (AFM 51-37, para. 13-5b.)

Our Crowded Skies

It's never too late to "see and avoid"



About 1026 on 6 Feb 1980, a Cessna TU-206G, N7393N, and a United States Air Force General Dynamics F-111D, collided about 11 miles northeast of Cannon Air Force Base. The Cessna, destined for Clovis, NM, departed Alemeda Airport near Albuquerque and made an en route stop at Tucumcari, NM, prior to the mishap. The F-111 was returning to Cannon AFB after completing a cross-country training flight. As you will see, the scenario is a familiar one.

FLIGHT HISTORY

The Cessna departed Albuquerque on a business trip to Clovis. The aircraft was piloted by the president of the company which owned the aircraft. He was accompanied by a business associate. The Cessna crew made an en route stop at Tucumcari and, before departing for Clovis, filed a VFR flight plan. The pilot received a weather briefing and information on jet traffic in the Clovis vicinity when he filed. En route weather was clear with 30 miles visibility. The flight plan proposed a cruising altitude of 7,500 feet MSL and a true airspeed of 125 knots. The Cessna was equipped with an emergency locator transmitter (ELT) and a transponder, without an altitude encoder, which was set to beacon code 1200.

The Cessna departed for Clovis at 1007 MST. There is no flight service station or tower facility at Clovis. At 1026, just before the mishap, a Flight Service Station (FSS) operator heard a radio transmission from the Cessna, apparently attempting to establish radio contact. The operator tried to contact the Cessna but was unsuccessful. Neither the operator nor any Clovis fixed base operators received transmissions from the Cessna.

Cannon AFB is located about 13 miles southwest of the Clovis Municipal Airport. During regular hours of operation, concentrations of high performance military jet aircraft operate from Cannon on a routine basis. This facility operates a radar approach control center (RAPCON) which provides Stage II radar service to all pilots, military and civilian, who request the service when arriving, departing, or transiting the Clovis area.

On the same morning that the Cessna was en route to Clovis, a USAF F-111D departed Cannon AFB at 0923 on a cross-country training flight. A

Mishap With A Moral

flight combat team, an aircraft commander, and a weapons systems officer (WSO), manned the aircraft. The mission was planned to terminate at Cannon later that day.

At approximately 1006, as the F-111 returned to Cannon, Albuquerque ARTCC transferred control of the aircraft to the Cannon RAPCON approach controller. When the F-111 was about 40 miles northwest of the Cannon TACAN, the controller radar identified the aircraft and requested the type of approach the aircraft commander desired. The pilot requested a HI-TACAN runway 21 penetration and an airborne instrument landing approach (AILA). This approach allows the tactical pilot to make a low visibility instrument approach, simulated or otherwise, to a programmed landing site displayed on the aircraft's radar screen.

Shortly thereafter, the F-111 pilot advised the RAPCON approach controller he would make a low approach followed by a missed-approach. He would then execute a circling maneuver to land on the same runway. The approach controller issued missed approach instructions and cleared the flight to descend. About 1017, the pilot was told to expect a turn in the holding pattern and, at 1019 the F-111 was cleared for a HI-TACAN runway 21 approach. About 1021, the pilot was requested to extend his outbound leg to provide spacing behind an aircraft turning base for runway 21. At approximately 1024, air traffic control of the F-111 was transferred to the RAPCON arrival radar controller. The transfer occurred while the F-111 was on the inbound approach track about 23 miles from the landing runway. Radio communications between the aircraft and the arrival controller were established routinely.

At approximately 1026, the flight was inbound 12 miles northeast of the airport when the controller cleared the F-111 for the AILA approach to runway 21. Almost simultaneous with the issuance of this clearance, the secondary transponder return of the F-111 disappeared from the controller's radar scope and the controller heard the sounds of an ELT on the tower watch frequency. At this time, another aircraft in the Cannon landing pattern notified the RAPCON controllers that a crash had occurred northeast of the airport.

The F-111D and the Cessna had collided. Occupants of both aircraft received fatal injuries. None of the RAPCON controllers had visually detected the Cessna or observed the transponder signal, and the Cessna pilot had not made radio contact.

Safety Board investigators interviewed three ground witnesses who had seen the midair collision. All three stated skies were clear and visibility was good at the time of the mishap. One witness stated the small aircraft exploded on collision and the large aircraft continued to fly straight ahead with the wings level. The witness further stated that within seconds after the collision, he saw an explosion in the F-111 and the aircraft gradually started downward until it disappeared from his view behind a hill. A second witness stated he saw the fighter aircraft roll to the left, the nose pitch down abruptly and, as the aircraft banked steeply, the crew escape capsule separated from the aircraft. The capsule parachute opened as the escape capsule hit the ground. The accident occurred about 1026, during daylight hours, approximately 11 miles northeast of Cannon AFB.

The crew ejection module impacted the ground nose down on its left side. After the initial ground impact, the module bounced approximately 30 feet and came to rest in an inverted position. The stabilization parachute, aft pitch flaps, forward chain straps, and recovery parachute deployed properly. Both ejection handles were found; the pilot's ejection handle was in the fired position and the WSO's handle was stowed. The position of the pilot's handle indicated he initiated the ejection process. The rocket motor was found to have functioned properly. An altitude of about 2,000 feet AGL is required for a successful module ejection. Evidence indicates that module ejection occurred at an altitude of about 1,300 feet AGL.

ANALYSIS

Neither pilot reported any mechanical problem or system malfunction which might have caused a distraction. There was no evidence the Cessna pilot had communication difficulties since shortly before

the collision he had made a radio call to the FSS. Although not required to, the Cessna pilot had the capability to transmit to RAPCON controllers and make his position and intentions known. The Safety Board believed that, had the Cessna pilot been in radio contact with the RAPCON facility, timely traffic advisories or radar vectoring might have prevented the mishap.

USAF directives require a military pilot to obtain approval for an AILA approach from the controlling agency before commencing the approach. The pilot is also required to request separation from other traffic if the radar service is available. While the F-111 pilot did request approval for the approach, he did not request separation from other traffic. Had he done so, the RAPCON controllers may have been on the alert for, and seen, the radar return of the Cessna.

During flight in visual flight conditions, crewmen are directed to ensure they are never occupied with cockpit duties simultaneously. The directive states that the "see and avoid" policy is mandatory and the aircraft's flight path should be visually cleared by at least one crewmember at all times. Rules pertaining to the flight of the F-111 and the Cessna state that when weather conditions permit, regardless of whether an operation is conducted under IMC or VMC, vigilance shall be maintained by each person operating an aircraft so as to "see and avoid" other aircraft. The FAA's Airman's Information Manual (AIM) explains in detail that it is the pilot's inherent responsibility at all times to anticipate circumstances, situations, and conditions which affect the safe operation of his aircraft. This widely distributed publication warns crewmembers to expect concentrated air traffic when near civil and military airports and in the vicinity of training areas.

Analysis of the collision geometry shows the F-111 was descending at a high rate of speed and struck the Cessna from the left side at approximately an 80-degree angle. As the flight paths converged during the last 10 miles of the F-111's flight, the Cessna would have moved from slightly right to directly in front of the F-111. Despite the difficulties encountered by the F-111 flightcrew in observing the Cessna because of the high closure rate and position of the Cessna relative to the F-111 cockpit structure, the Safety Board concluded the F-111 flight crew failed to "see and avoid" the Cessna.

The board recognized that the Cessna pilot also had a responsibility to "see and avoid" all relevant traffic. However, based on its projected flight path, the acute collision angle, the limitations to the field of vision imposed by the aircraft structure, and the high closure rate of the F-111, the board concluded the Cessna pilot could not have reasonably been expected to "see and avoid" the F-111.

Following the mishap, the Cannon RAPCON radar equipment was checked for operational capability and all components were found to function satisfactorily. Investigation revealed the Albuquerque ARTCC radar antenna received and recorded the code 1200 beacon response of the Cessna up to the time of collision. Since the board was not able to identify any technical reason why the RAPCON facility would have failed to receive the primary or secondary radar return of the Cessna once the aircraft entered the Cannon AFB controlled airspace, the board concluded the radar and beacon returns of the Cessna were displayed on the RAPCON radar scope. The Safety Board was unable to determine why the controllers did not observe the radar returns. It can be reasonably concluded that their attention was directed elsewhere. This controller oversight compromised the safety margin provided by the shared and overlapping responsibilities of pilot and controller which are intended to prevent collisions in the "see and avoid" environment.

PROBABLE CAUSE

The Safety Board determined the probable cause of this mishap was failure of both pilots to request radar traffic advisories, failure of the F-111 flight crew to "see and avoid" the Cessna, and failure of the RAPCON controllers to observe the Cessna radar target and issue traffic advisories to the F-111. Contributing to the mishap were limitations of the "see and avoid" concept in a terminal area with mixed low speed/high speed traffic.

APPLICATION TO MAC

The "see and avoid" concept has been around since the second flying machine took to the skies. Despite the emphasis we place on scanning and keeping our "heads out of the cockpit," we continue to run into each other. Granted, both pilots in this mishap should have used the ATC system to its fullest and requested traffic advisories, and RAPCON should possibly have picked up the Cessna on radar, but the fact remains that two aircraft collided on a perfectly clear day with 30 miles visibility.

The skies are getting increasingly crowded. Our missions take us into some of the most densely populated areas in the world. We cannot afford to let our guard down for even a second. Our lives and those of our passengers depend on it. ✈

Adapted from *NTSB-AAR-82-10*

CR. TERROR

The Global Galaxy Gallivanter proves haste makes waste.

"Sammy m'boy, this trip will be the one! My agent in Mildenhall has three specimens of early model Jaguars waiting for my evaluation. I have been assured all three are excellent examples of what we know to be the finest automobile to grace the roads of the civilized world."

"Boss, I've always been partial to American made cars. Why, my '68 Mustang was so fast . . . ."

"Nonsense Sammy; as you mature, your ability to recognize the finer things in life will improve. The time will come when you'll realize the error of you current evaluation."

"But Boss, why do you have to go to England to get such a machine? Can't you just find an older model on a car lot here in the states, or wouldn't it be better to save up a little longer and buy a new car?"

"Tut, tut, m'boy. You fail to appreciate the fact that great automobiles are similar to fine wine. They both improve with age. Besides, I've always preferred

Jaguars' domestic models over their export version. I've often wondered just how much British 'spirit' the company put into a car they knew was destined for the 'Colonies'."

"Major Terror, I've got your weather brief." These words brought C.R. and Sammy back to the business at hand, and the Dynamic Duo turned their attention to the Dispenser of Weather Wisdom. The briefing held only good news; no thunderstorms or excessive turbulence predicted, and a favorable jet stream to hurry our heroes along. After a short delay at the counter, a result of C.R. still not having the expertise to correctly fill out an 1801, Sammy filed the flight plan and called the crew bus.

Within minutes, C.R. and Sammy had joined the remainder of the crew at the airplane. As soon as the Airways Airdale entered the cargo compartment, MSgt. Torque handed the Great One a 781 approaching the dimensions of the Manhattan yellow pages. With just a hint of concern in his voice, Sergeant Torque began to speak, "Major, this Galaxy is an east coast bird and has seen more than her fair share of DESERT STORM. None of the write-ups are worth a red 'X,' but this plane has an awful lot of little things wrong with it. You might want to spend some extra time with the forms."

"Gadzooks Max, time is the luxury I'm shortest of! Sammy can peruse the forms when he gets the chance. Right now, I want to be sure the loading is just about done and get on with the business at hand. No more late takeoffs for us!" The Rhinestone Flyboy handed the forms to Sammy, destined for the crew deck, and turned toward the back of the plane. "Sergeant Downs, what have we got, and how much longer?"

"Just about loaded Boss. We've got more than 30,000 pounds of Class A explosives as well as some rolling stock. No smoking on this flight!"

Our Magnificent Major, starting up the stairs toward the flight deck replied, "Right you are m'boy. Give us a call as soon as you're finished and we'll be on our way."

Within minutes, Sergeant Downs reported "load secure" and the crew quickly finished the necessary preflight operations. Much to Sammy's surprise, the Ace of Aerospace deviated from his normal "Kick the tires and light the fires" predeparture mode. He actually made some comments indicating he was aware of the hazardous nature of their cargo. He made it clear that if any problems developed, he would much rather handle them on the ground than in the air.

Upon taxi from the hot cargo area, C.R. tasked Sammy to request an immediate takeoff. For the first time in anyone's memory, it appeared the Terror Team would actually take off not only on time, but in the first few minutes of the window.

For once, Lady Luck was solidly on C.R.'s side. The takeoff was so close to flight manual perfection, it would have made Col. Fang either cry with joy or drop dead from shock.

During climbout, the Field-Grade Fumbler was so excited about finally making a near-perfect departure, it took numerous helpful hints from Sammy to get C.R. to call for the required checklists.

"Crew, Pilot, now *that's* how it's done! I only wish Blinky could

have been with us to take part in a true team effort. He should be done with his quality facilitator training when we get back, so maybe we can achieve the same magnificent performance the next trip out."

"Yeah Boss, I spoke to Blinky before we left; he seemed pretty excited about the training."

"As well he should be," replied the Great One. "Quality is going to play a big part in MAC's future. The more a person knows about the program, the better he'll understand how things are going to be done from here on out. To tell the truth, I'm sort of interested in this facilitator stuff myself; can't hurt to get in on the ground floor on something that's going to be as important as this."

"Boss, you could never get yourself to stay on the ground long enough to get the training. You start to look nervous even before your post mission crew rest runs out," added Sammy.

"Maybe you're right Sammy. After all, it certainly would be teaching an old dog new tricks. Still, if I was a young lad like yourself, I'd get as involved as I could."

"Got ya Boss," replied Sammy.

"Back to business. Sammy, engage the Fuel Savings Advisory System and the Auto Throttle system. No sense burning any more gas than we have to. Ya never know when you might need it."

"Engaged, Captain Kirk," answered Sammy in his best Star Trek voice.

Less than one minute later, Sergeant Torque noted a fault code display on the C-5s MADAR. "Pilot, engineer, I've got a fault code that says we need to look at fan rotor speeds."

"Gadzooks! Our N-1 gauges are at the top of the scale. We must be approaching warp drive! Sammy, disconnect the auto throttles, let's slow this old girl down before she has a heart attack."

"Auto throttles disconnected and mach level decreasing. How fast were the rotors going?" replied Sammy.

"Pilot, engineer, I just ran an engine health check and all four engines were oversped in addition to exceeding maximum allowable turbine inlet temperatures. I'm not positive what caused this, but I think I remember something in the forms about the FSAS being less than perfect. It was on one of the early pages. Who's got the forms?"

Sammy reached down along side his seat, "I've got'm here . . . I never got around to them. I figured we'd have a little more time than we did before takeoff."

Sergeant Torque grabbed the forms from Sammy. But, before he looked through them for the writeup he picked up his Dash One and looked for guidance on how to handle the overspeed/overtemp problem. "Boss, the Dash One doesn't really address what happened. Our overspeed/overtemp was transient and the engine readings are fine now. We'll have to add it to the 781 writeups, but that may be all that's required."

Sammy was the first to respond, "The values are all okay now, but we don't really know how long they were over limits. We can't shut four engines down as a preventative measure, so the next logical step appears to be landing at the first available maintenance facility. That means air abort and back to home drome."

"Pilot, engineer, I'm afraid I have to agree with that. The safest thing to do is turn around and have maintenance take a look. By the way, I found the writeup. It was one of the early entries and the FSAS apparently caused something like this once before, but not to this level. The writeup is marked fly-as-is, and to tell you the truth, I forgot about it. There are so many after it that this one just slipped my mind. Sorry Boss."

Sammy and Max braced themselves for a world-class Terror temper tantrum. What they got instead couldn't have surprised them more. In a voice as fatherly as Walter Cronkite's, the Benevolent Major simply said, "It's not just your fault, Max, you tried to get me to look the forms over and I just pushed it off on Sammy who had enough to do already. It doesn't appear any real damage has been done, but let's play it safe, take this girl back to the barn, and let the wrench wrestlers see what they can find. Sammy, give center a call and ask for direct back to home station."

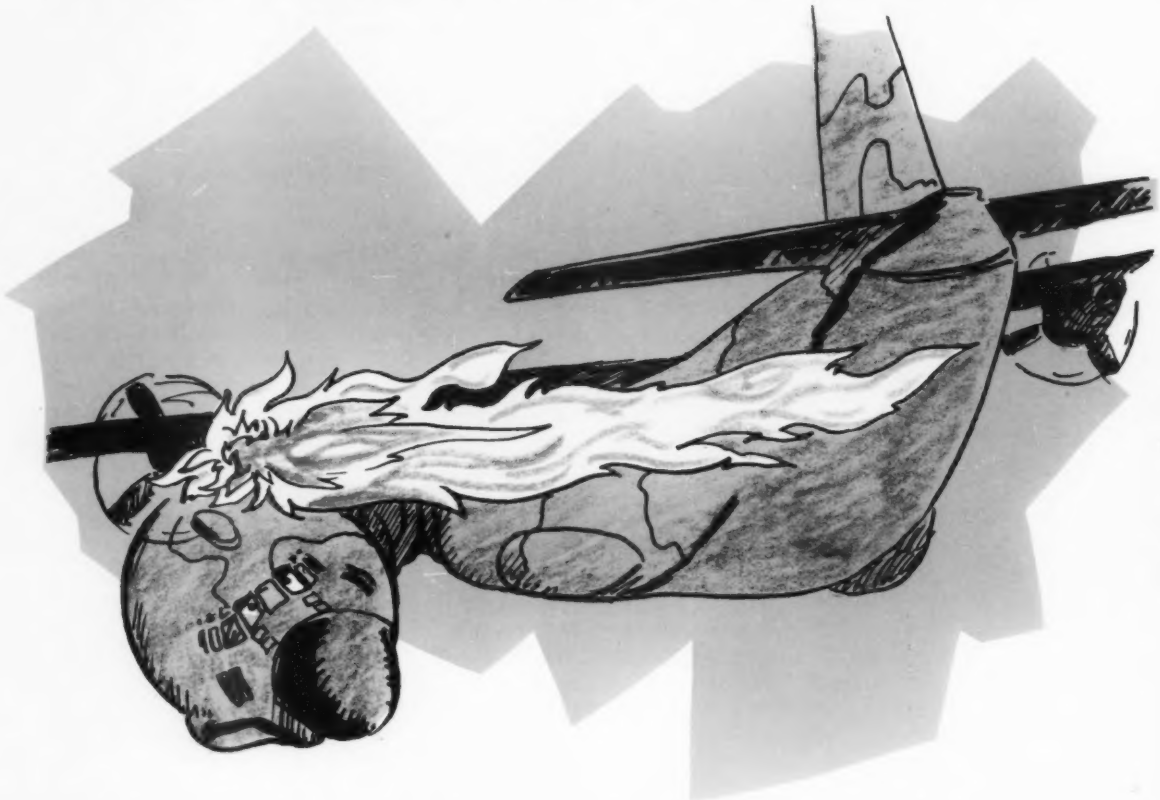
The return trip was uneventful, and before long everyone was back in the crew bus. As they pulled up to the squadron, and before C.R. headed in for the unavoidable debrief with Col. Fang, he turned to Sammy and said, "You know, I wonder how much a commercial ticket to London would be? I'm starting to think that's the only way I'll ever be able to get my Jaguar."

"Boss, I hate to say it, but you just may be right." ★

QUICKSTOPPERS

FIRE ON NUMBER ONE

Inbound to the FOB, the C-130 aircrew heard a loud noise and felt the aircraft yaw left. RPM on Number One engine increased to 104 percent as the torque, TIT, and fuel flow dropped. The flight engineer selected "mechanical governing" and "null" for the affected engine. Seconds later, the crew detected a louder noise and yaw increased to the left. By now, the aircrew could see flames extending eight feet behind the Number One tailpipe. The copilot feathered the propeller and pulled the fire handle in accordance with the Dash One procedures. The propeller feathered and all gauges went to zero, but the flames continued. The copilot fired the first fire bottle, which decreased the flame intensity somewhat, but the fire continued. The aircraft commander began a rapid descent and, within ten seconds increased airflow blew out all remaining flames. An uneventful landing followed. Maintenance investigation revealed severe damage to the Number One turbine. The rear turbine pump, cone, and oil tube had departed the aircraft, and holes were found in the casing and clamshell door with small dents on the outboard side of the left external pylon fuel tank. Once again, good training and professionalism paid off.



A BRIEF ON RELIEF

En route to destination, the pilot of this small civilian puddle-jumper felt nature calling. He decided to land on a paved road (no cars in sight for miles, desolate). He landed, exited, and returned. During takeoff roll, at about 40-45 mph, he observed a vehicle approaching in the distance. He seemed startled and abruptly pulled back on the yoke, lifting the plane off. It then mushed back down onto the road shoulder, hitting a bush with the right main gear which separated from the wing. The plane skidded to a stop, damaging the bottom of the right wing and right landing gear. The pilot shut off the engine and exited, uninjured. A normal takeoff would have been possible had the yoke not been prematurely pulled back. Although the incident occurred far from any civilization, the decision to land on an unapproved surface was probably not indicative of sound judgment. A portable relief bottle, available in both ladies' and gents' versions, makes an excellent gift for the pilot who hasn't thought of everything.

Adapted from NASA's *CALLBACK* Safety Bulletin

Follow the Guidance

The mishap C-5 departed an overseas location for home station without difficulty. Fifteen minutes later, during climb to FL 230, the scanner reported fuel leaking from two MH2B hydrant hose carts in the cargo compartment. The crew descended immediately to FL 180 and cleaned up three gallons of fuel which had spilled. They diverted to a European base where they offloaded the carts. Investigation of the carts revealed fuel lines on both carts contained fuel and both vent valves on top of the filter separators were closed. After removing the two carts from the aircraft and cleaning/inspecting the cargo compartment, the mission continued uneventfully to home station. Further investigation revealed the hose carts were

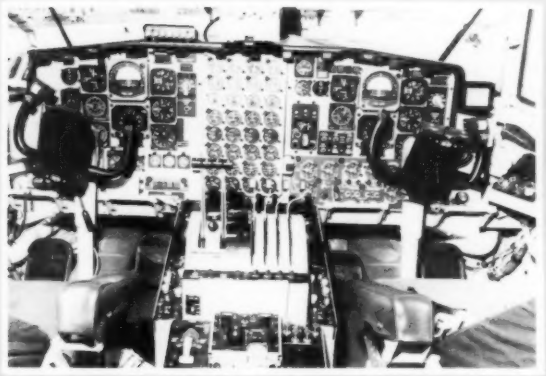
prepared IAW the proper T.O.; however, actions should have included draining fuel, purging the units, blocking the segregator float valve, and installing new filters in addition to removing all drain plugs. Further guidance required removal of pipes and hoses, and aeration of all components for approximately six hours before air shipment. The guidance was not followed, which resulted in fuel remaining in the carts. In a quality operation, we assume everyone is doing his/her job correctly and to the best of their ability. Unfortunately, some people take more convincing.

FEED ME, FEED ME!

While cruising at FL 390 with 34,000 pounds of fuel remaining in the main tanks, the flight engineer of a C-141 began arranging the fuel panel to redistribute fuel. He closed all crossfeed, separation, and refuel valves, and turned on all primary boost pumps in the main tanks. He then opened all crossfeed valves and placed Numbers Two and Three main tank secondary boost pumps on. He stated that he then, unconsciously, turned off the primary boost pumps for main tanks one and four. This configuration allowed air to enter the fuel lines. As a result, both Number One and Four engines began to be starved for fuel. Unaware of the condition, he opened the left and right separation valves and turned his attention to completing landing data. Just as he turned away from the panel, Number One engine flamed out. Hearing the rollback, the engineer looked up to find the Number One engine "pump out" light on, immediately followed by flameout of Number Four engine (you guessed it— another "pump out" light). Realizing his mistake, the engineer immediately closed the left and right separation valves and turned on Numbers One and Four primary boost pumps. The crew was able to airstart Number One engine, but attempts to get Number Four running failed. An "uneventful" landing followed. Obviously, no one is immune from lapses of concentration.

AFTER DEADLINES

NEW LOOK FOR THE HERCULES - Lockheed Aeronautical Systems Company (LASC) developed this Electronic Glass Cockpit with Active Matrix Liquid Crystal Displays (AM-LCD) for the C-130. The new system made its maiden flight test, 28 Feb. Six digital LCD flat panel displays replace more than 60 electro-mechanical cockpit instruments currently used on the Hercules. The AM-LCDs are manufactured by Litton Systems, Canada Ltd.,and present flight attitude, navigation, weather radar, and engine operating data. According to Ray Frewer, C-130/L-100 Program Engineering Manager for LASC, "These units require only one fourth of the depth required by television type Cathode Ray Tubes (CRT) in operation on some of the newer commercial aircraft. Being shorter than CRTs, the LCD units are easier to install in the limited space behind an aircraft instrument panel. Digital processing, reduced electrical power, reduced weight and cooling requirements, as well as durability, are added benefits of this kind of technology." Under contract with the U.S. Air Force, LASC developed the electronic cockpit as a possible future enhancement to reliability and maintainability for the C-130. Testing of the Hercules glass instrumentation will continue over the next eight months.



ASD TRANSFERS RESPONSIBILITY FOR AIRLIFT PROGRAMS TO AFLC - The VC-25A and C-29A aircraft programs were transferred from Aeronautical Systems Division (ASD) to Oklahoma City Air Logistic Center (OC-ALC), Tinker AFB, Okla. The two new presidential aircraft are specially configured Boeing 747s designated VC-25A which use the call sign "Air Force One" when the president is on board. They replace the current Boeing 707. Designed to operate in all climates year round, each aircraft can fly 7,140 miles without refueling and accommodate 70 passengers and 23 crewmembers. The C-29A combat flight inspection aircraft is a twin-engine British Aerospace 125-800A jet. Electronic devices carried by the C-29A enable technicians to inspect and calibrate air traffic control and landing systems.

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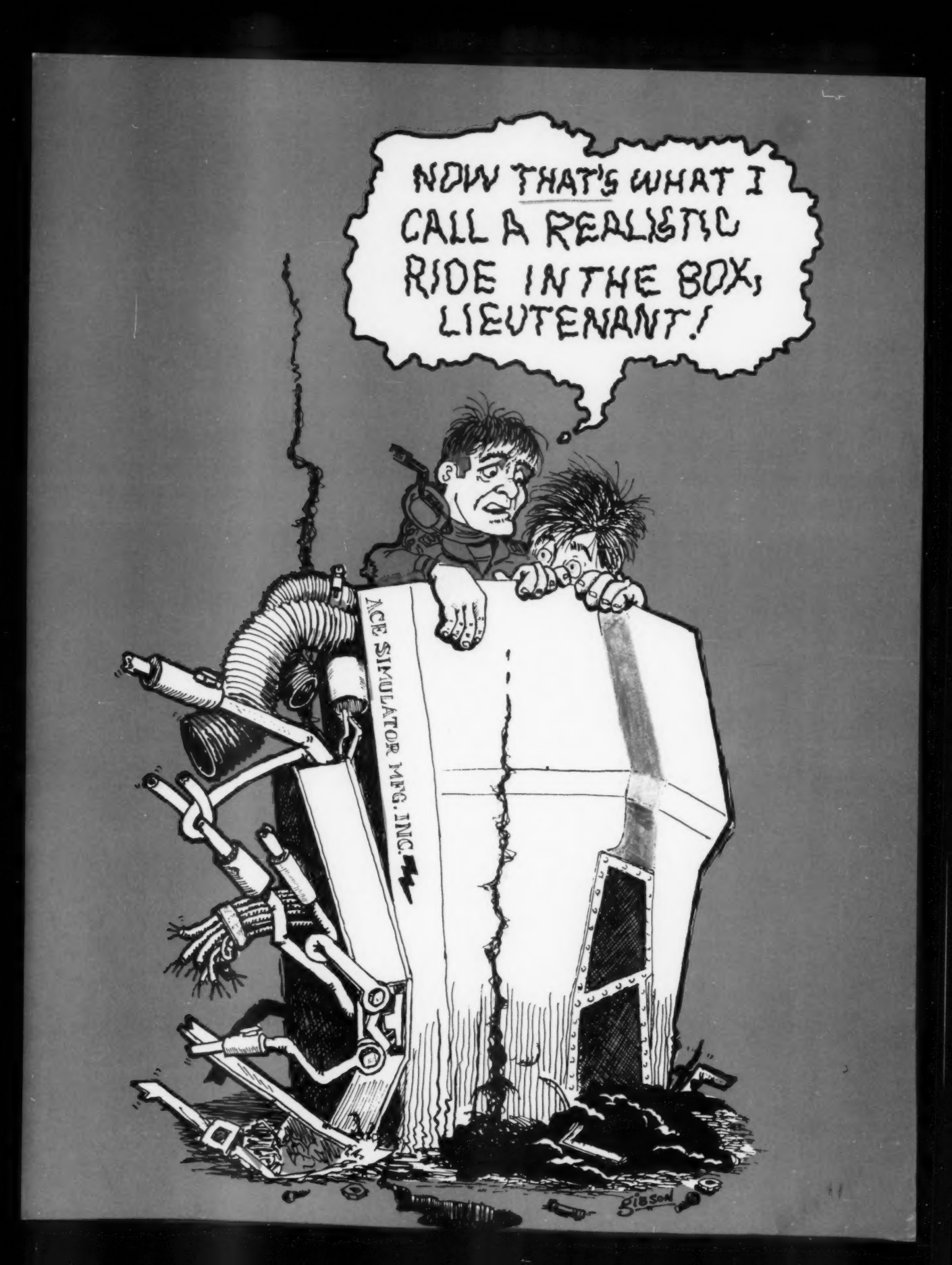
NOW THAT'S WHAT I CALL A REALISTIC RIDE IN THE BOX, LIEUTENANT!
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